N89-11761

NASA OAST

CIVIL SPACE TECHNOLOGY INITIATIVE

CSTI

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LARGE SPACE SYSTEMS

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SPACE R&T STRATEGY

OAST

REVITALIZE TECHNOLOGY FOR LOW EARTH ORBIT APPLICATIONS

DEVELOP TECHNOLOGY FOR EXPLORATION OF THE SOLAR SYSTEM

MAINTAIN FUNDAMENTAL R&T BASE

BROADEN PARTICIPATION OF UNIVERSITIES

EXTEND TECHNOLOGY DEVELOPMENT TO IN-SPACE EXPERIMENTATION

FACILITATE TECHNOLOGY TRANSFER TO USERS

MISSION NEEDS

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- TRANSPORTATION TO LOW EARTH ORBIT
  - PROPULSION
  - AEROBRAKING
- OPERATIONS IN LOW EARTH ORBIT
  - AUTONOMOUS SYSTEMS
  - TELEROBOTICS
  - POWER
- SCIENCE
  - STRUCTURES
  - SENSORS
  - DATA SYSTEMS

BACKGROUND

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- THE FIRST STEP IN REVITALIZING THE NATION'S CIVIL SPACE TECHNOLOGY BASE
- WILL FILL GAPS IN MANY TECHNOLOGY AREAS
- FOCUSED TECHNOLOGY EFFORT, WILL RESULT IN DEMONSTRATED / VALIDATED TECHNOLOGIES

EARTH TO ORBIT PROPULSION

OAST — CSTI

OBJECTIVE:

PROVIDE A VALIDATED TECHNOLOGY BASE FOR THE DESIGN OF HIGH PERFORMANCE, LONG LIFE LOX/H2 AND LOX /HC ENGINES

- ENABLE FULLY REUSABLE VEHICLES TO REDUCE TRANSPORTATION COSTS

APPROACH:

EXTEND KNOWLEDGE AND UNDERSTANDING OF ROCKET ENGINE CHEMICAL AND PHYSICAL PROCESSES BY BUILDING AND VALIDATING COMPONENTS AND HEALTH MONITORING DEVICES

EARTH TO ORBIT PROPULSION

MANAGEMENT

- LEAD OAST DIVISION

  PROPULSION, POWER AND ENERGY DIVISION

- LEAD NASA FIELD CENTER

  MARSHALL SPACE FLIGHT CENTER

- PARTICIPATING CENTER

  LEWIS RESEARCH CENTER

- FY 1989 BUDGET : $ 29.1 M

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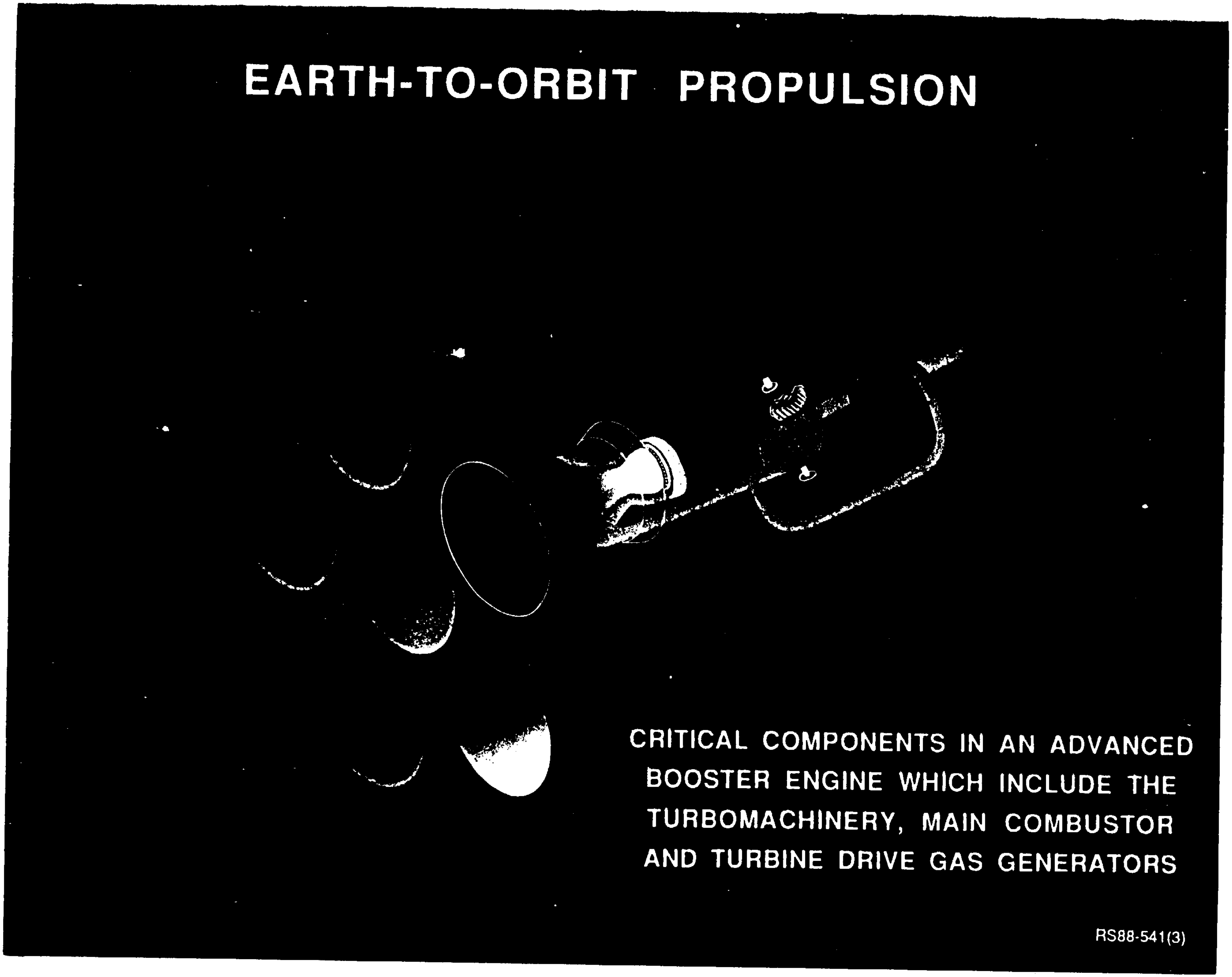


BOOSTER TECHNOLOGY

OAST CSTI

OBJECTIVE:

DEVELOP THE ENGINE TECHNOLOGY FOR ALTERNATE PROPULSION CONCEPTS FOR THE SPACE SHUTTLE SOLID ROCKET BOOSTER (SRB)

- PROVIDE A SAFE ABORT OPTION
- PROVIDE THE ABILITY TO TAILOR THRUST
- PROVIDE THE POTENTIAL FOR ADDITIONAL IMPULSE

APPROACH:

EXPLORE ALTERNATIVE BOOSTER TECHNOLOGIES INCLUDING LIQUID AND HYBRID CONCEPTS

BOOSTER TECHNOLOGY

OAST — CSTI

MANAGEMENT

- LEAD OAST DIVISION

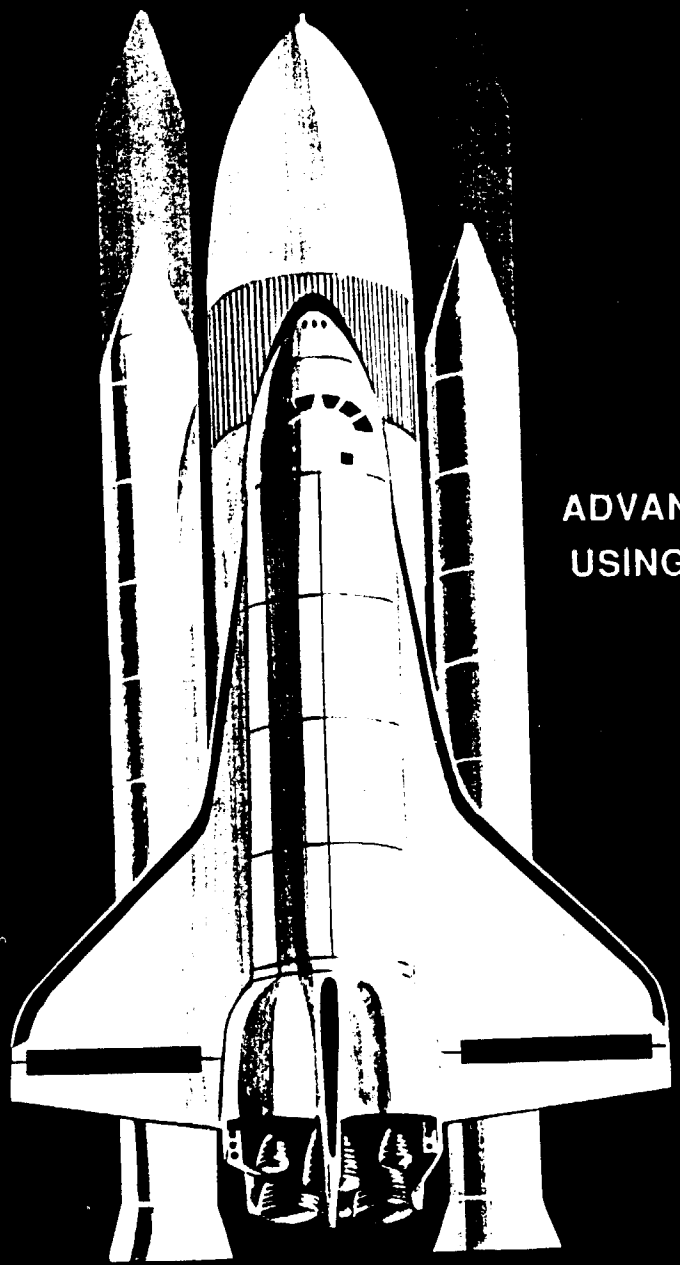
  PROPULSION, POWER, AND ENERGY DIVISION

- LEAD NASA FIELD CENTER

  MARSHALL SPACE FLIGHT CENTER

- FY 1989 BUDGET: $ 9.0 M

BOOSTER TECHNOLOGY



ADVANCED HYBRID BOOSTERS
USING ADVANCED MATERIALS

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AEROASSIST FLIGHT EXPERIMENT

OAST — CSTI

OBJECTIVE:

INVESTIGATE THE CRITICAL VEHICLE TECHNOLOGIES AND UPPER ATMOSPHERIC CHARACTERISTICS APPLICABLE TO THE DESIGN OF AN AEROASSISTED ORBITAL TRANSFER VEHICLE

- PROVIDE A LARGE SAVING IN PROPELLANT WHICH COULD DOUBLE THE PAYLOAD WEIGHT

APPROACH:

CONDUCT A REENTRY FLIGHT EXPERIMENT THROUGH THE UPPER ATMOSPHERE TO VALIDATE DESIGN CODES

AEROASSIST FLIGHT EXPERIMENT

OAST — CSTI

MANAGEMENT

- **LEAD OAST DIVISION**

  FLIGHT PROJECTS DIVISION

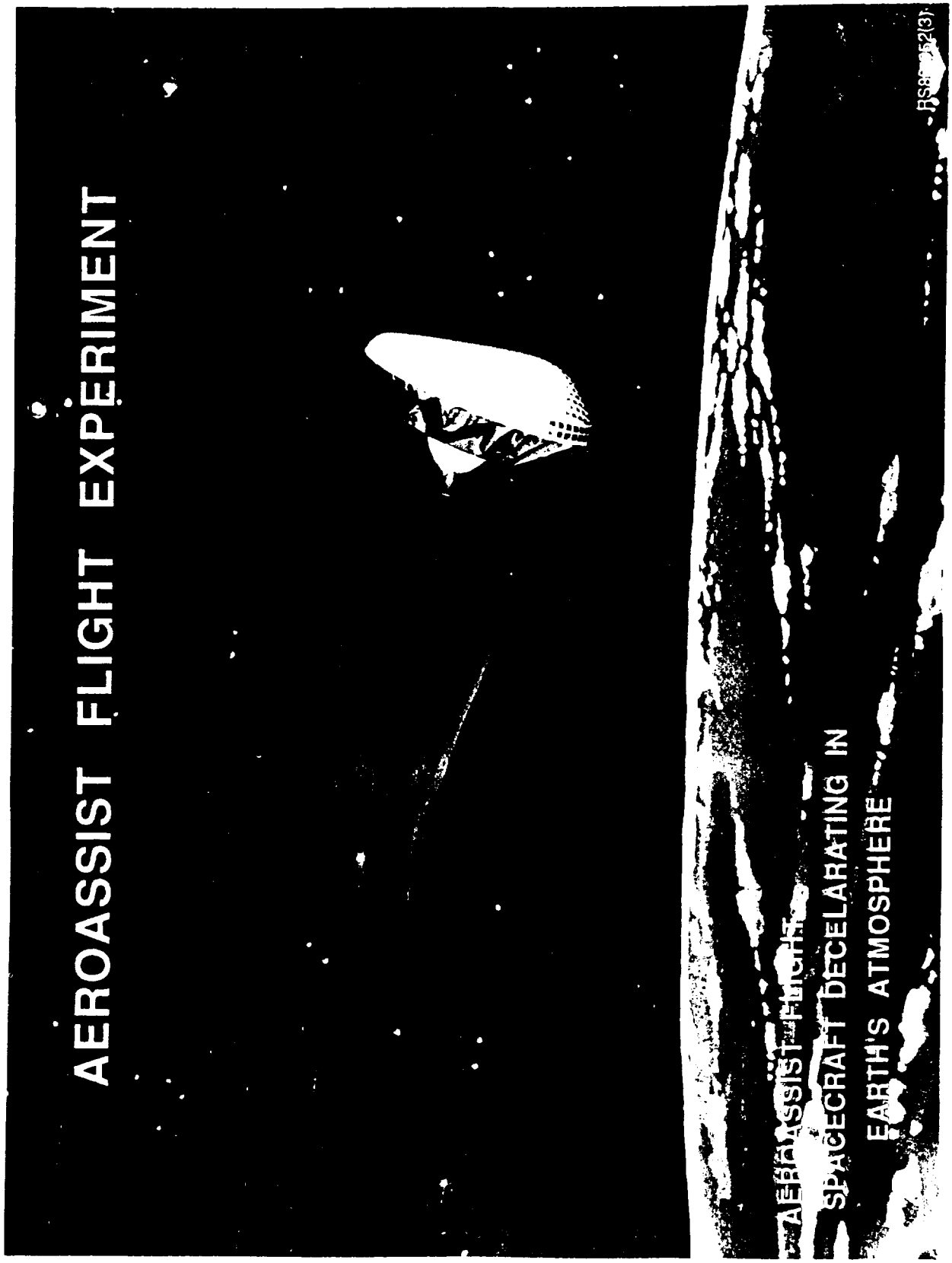
- **LEAD NASA FIELD CENTER**

  MARSHALL SPACE FLIGHT CENTER

- **PARTICIPATING CENTERS**

  LANGLEY RESEARCH CENTER
  JOHNSON SPACE FLIGHT CENTER
  AMES RESEARCH CENTER

- **FY 1989 BUDGET: $ 13.3 M**



ROBOTICS

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OBJECTIVE:

DEVELOP THE TECHNOLOGY BASE REQUIRED TO EVOLVE FROM TELEOPERATIONS TO TELEROBOTICS

- PERFORM SPACE ASSEMBLY AND CONSTRUCTION, SATELLITE SERVICING, AND PLATFORM MAINTENANCE AND REPAIR EFFICIENTLY AND SAFELY

APPROACH:

DEVELOP COMPONENTS TO BE EVALUATED IN AN INTEGRATED TESTBED THAT WILL DEMONSTRATE CAPABILITIES SUCH AS STOPPING SLOWLY SPINNING SPACECRAFT, PERFORMING SIMPLE SERVICING, ETC.

ROBOTICS

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MANAGEMENT

- **LEAD OAST DIVISION**

  INFORMATION SCIENCES AND HUMAN FACTORS DIVISION

- **LEAD NASA FIELD CENTER**

  JET PROPULSION LABORATORY

- **PARTICIPATING CENTERS**

  GODDARD SPACE FLIGHT CENTER
  LANGLEY RESEARCH CENTER
  JOHNSON SPACE CENTER

- **FY 1989 BUDGET : $ 13.8 M**

ROBOTICS

ADVANCED DUAL ARM MANIPULATOR WITH DEMONSTRATED VISUAL TRACKING CAPABILITY

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SCIENCE SENSOR TECHNOLOGY

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OBJECTIVE:

DEVELOP AN ADVANCED SENSOR TECHNOLOGY BASE FOR SCIENTIFIC SENSING INVESTIGATION OF EARTH SYSTEMS, THE SOLAR SYSTEM, AND THE UNIVERSE

- DEVELOP PASSIVE, SENSITIVE, RELIABLE, AND IMPROVED IMAGING CAPABILITY OF SPACE-BASED ADVANCED DETECTORS
- KEEP COSTS TO A MINIMUM

APPROACH:

DEVELOP ADVANCED TUNABLE SOLID STATE AND GAS LASERS AND ACCOMPANYING ADVANCED TECHNOLOGY

SCIENCE SENSOR TECHNOLOGY

MANAGEMENT

- **LEAD OAST DIVISION**

  INFORMATION SCIENCES AND HUMAN FACTORS DIVISION

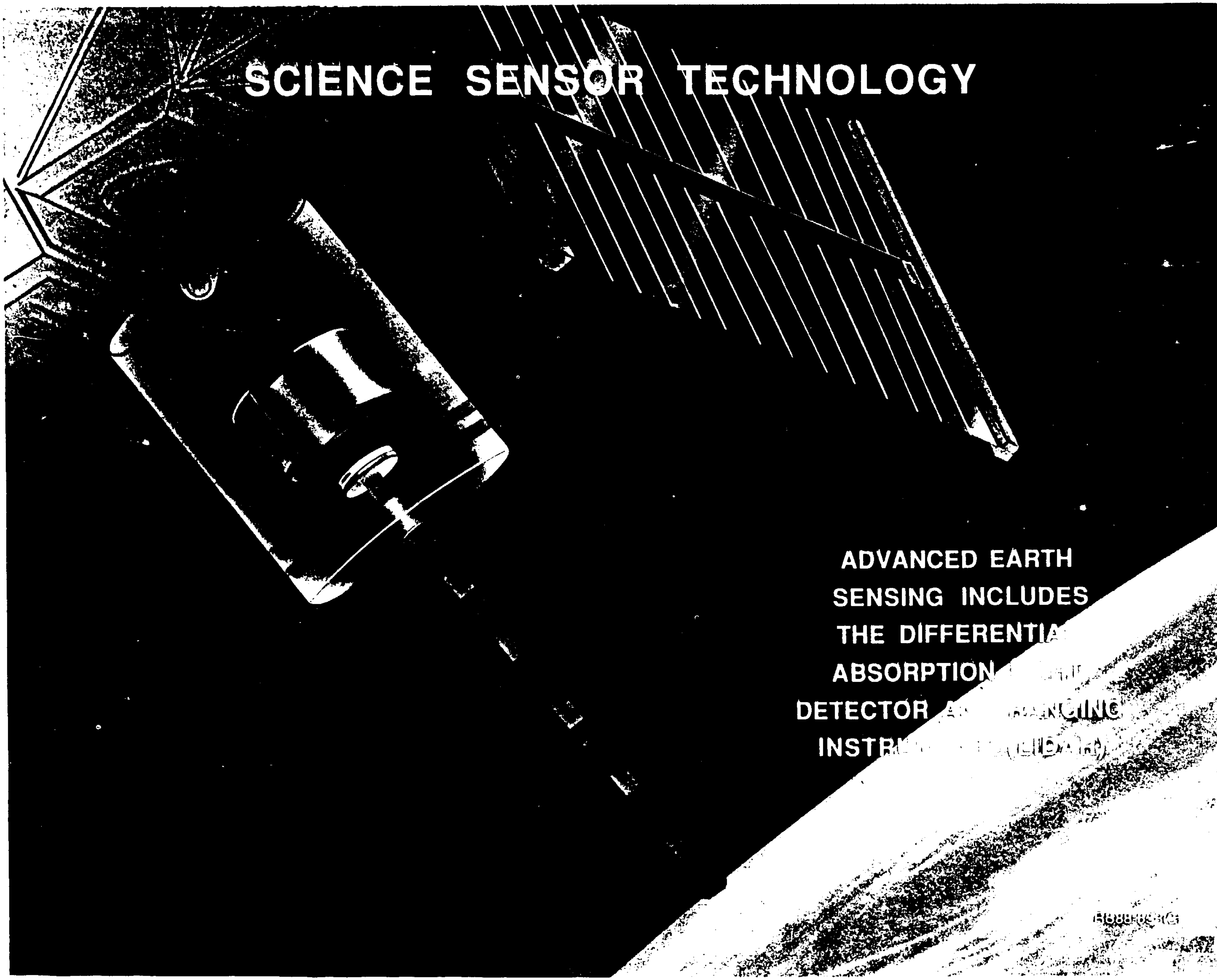
- **LEAD NASA CENTER**

  LANGLEY RESEARCH CENTER

- **PARTICIPATING CENTERS**

  GODDARD SPACE FLIGHT CENTER
  JET PROPULSION LABORATORY
  MARSHALL SPACE FLIGHT CENTER
  AMES RESEARCH CENTER
  LEWIS RESEARCH CENTER

- **FY 1989 BUDGET : $ 7.8M**



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AUTONOMOUS SYSTEMS

OAST CSTI

OBJECTIVE:

DEVELOP AN ARTIFICIAL INTELLIGENCE TECHNOLOGY BASE FOR EFFICIENT AUTONOMOUS OPERATIONS IN SPACE AND ON THE GROUND

- FREE HUMAN RESOURCES FROM ROUTINE OPERATIONS
- DECREASE COSTS OF SPACE OPERATIONS

APPROACH:

DEMONSTRATE KNOWLEDGE BASED DECISION MAKING, MACHINE LEARNING, UNCERTAINTY PLANNING AND SIMILAR ADVANCED CONCEPTS

AUTONOMOUS SYSTEMS

OAST CSTI

MANAGEMENT

- **LEAD OAST DIVISION**
  - INFORMATION SCIENCES AND HUMAN FACTORS DIVISION
- **LEAD NASA FIELD CENTER**
  - AMES RESEARCH CENTER
- **PARTICIPATING CENTER**
  - JOHNSON SPACE CENTER
- **FY 1989 BUGET: $ 12.1 M**

AUTONOMOUS SYSTEMS

AUTONOMOUS SYSTEMS APPLICATIONS
AIDING THE INTEGRATED COMMUNICATIONS
OFFICER (INCO) IN MISSION CONTROL CENTER

RS88-559(3)

DATA: HIGH RATE/CAPACITY

OAST — CSTI

OBJECTIVE:

DEVELOP HIGH SPEED, HIGH VOLUME DATA HANDLING TECHNOLOGIES AND SYSTEMS NEEDED TO MEET THE SCIENTIFIC AND OPERATIONAL REQUIREMENTS OF FUTURE MISSIONS

- PERFORM RECOGNITION, EXTRACTION, AND TRANSMISSION OF SIGNIFICANT OBSERVATIONS ON-BOARD THE SPACECRAFT
- ENSURE HIGH SCIENTIFIC RETURNS WHILE KEEPING OPERATIONAL COSTS LOW

APPROACH:

PRODUCE, TEST AND VALIDATE FLIGHT QUALIFIABLE COMPONENTS FOR ON-BOARD DATA PROCESING AND STORAGE

DATA : HIGH RATE /CAPACITY

OAST CSTI

MANAGEMENT

- **LEAD OAST DIVISION**

  INFORMATION SCIENCES AND HUMAN FACTORS DIVISION

- **LEAD NASA FIELD CENTER**

  LANGLEY RESEARCH CENTER

- **PARTICIPATING CENTERS**

  GODDARD SPACE FLIGHT CENTER
  JET PROPULSION LABORATORY

- **FY 1989 BUDGET : $ 8.1 M**

DATA: HIGH RATE/CAPACITY

CONTROL OF FLEXIBLE STRUCTURES

OAST — CSTI

OBJECTIVE:

DEVELOP STRUCTURES AND CONTROLS TECHNOLOGY THAT WILL ENABLE THE DESIGN VERIFICATION AND QUALIFICATION OF PRECISION SPACE STRUCTURES AND LARGE FLEXIBLE SPACE SYSTEMS

- INCREASE SURFACE AND POINTING PRECISION AND USE OF ARTICULATED MOVING COMPONENTS

APPROACH:

VERIFY THE ANALYSIS AND DESIGN METHODS THROUGH GROUND TESTS AND IN-SPACE FLIGHT EXPERIMENTS

CONTROL OF FLEXIBLE STRUCTURES

OAST — CSTI

MANAGEMENT

- **LEAD OAST DIVISION**

  MATERIALS AND STRUCTURES DIVISION

- **LEAD NASA FIELD CENTER**

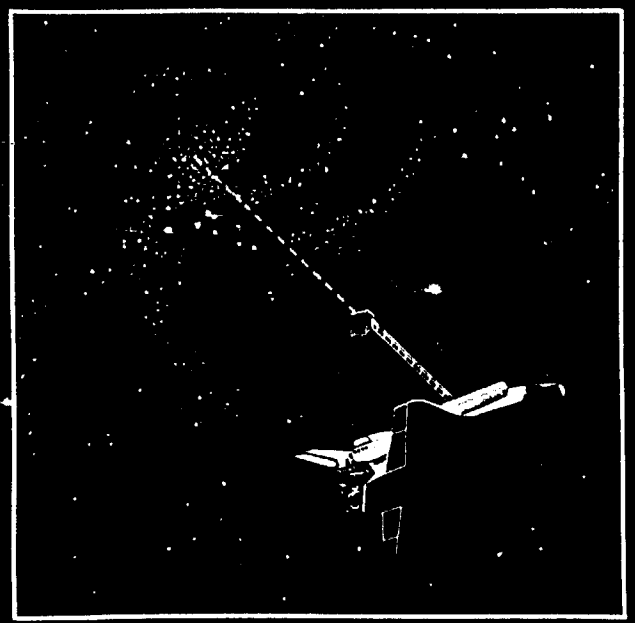
  LANGLEY RESEARCH CENTER

- **PARTICIPATING CENTERS**

  MARSHALL SPACE FLIGHT CENTER
  JET PROPULSION LABORATORY
  GODDARD SPACE FLIGHT CENTER

- **FY 1989 BUDGET: $15.7 M**

CONTROL OF FLEXIBLE STRUCTURES



CONTROL AND STRUCTURES
EXPERIMENT IN SPACE

RS88-553(3)

PRECISION SEGMENTED REFLECTORS

OAST CSTI

OBJECTIVE:

DEVELOP THE MATERIALS, STRUCTURES, AND CONTROL TECHNOLOGY TO ENABLE THE DESIGN OF LARGE, LIGHT-WEIGHT, HIGH PRECISION ORBITING ASTRONOMICAL INSTRUMENTS

- DEVELOP LIGHT-WEIGHT AND SPACE ERECTABLE/DEPLOYABLE SYSTEMS FOR MAKING DEEP SPACE OBSERVATIONS IN THE SUB-MILLIMETER AND SMALLER PORTION OF THE SPECTRUM

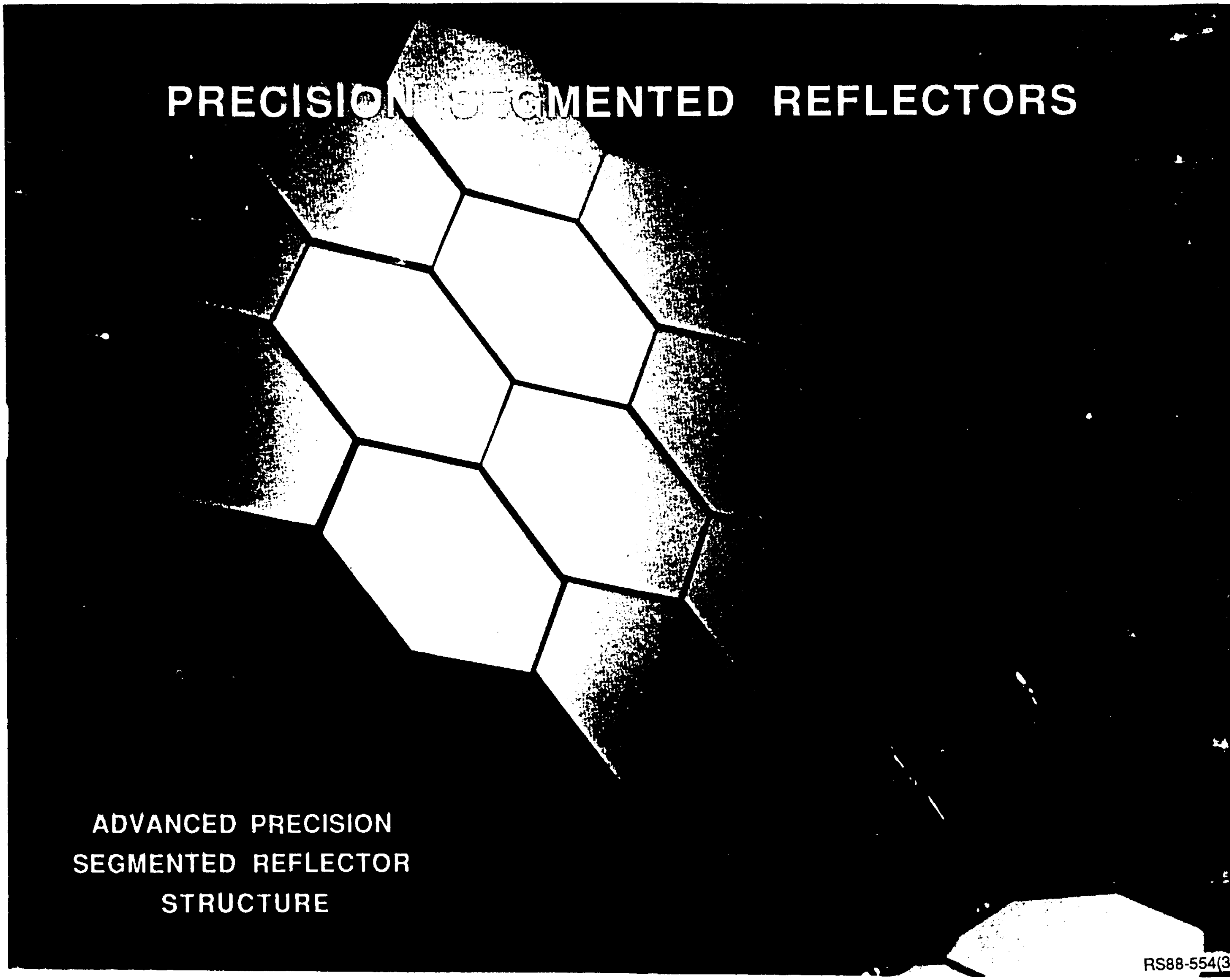
APPROACH:

FABRICATE HIGH SURFACE PRECISION PANELS AND CONDUCT SYSTEM LEVEL VALIDATION TESTING

PRECISION SEGMENTED REFLECTORS

MANAGEMENT

- LEAD OAST DIVISION
  - MATERIALS AND STRUCTURES DIVISION
- LEAD NASA FIELD CENTER
  - JET PROPULSION LABORATORY
- FY 1989 BUDGET: $4.9 M



HIGH CAPACITY POWER

OAST — OSTI

OBJECTIVE:

DEVELOP THE TECHNOLOGY BASE NEEDED TO MEET THE LONG DURATION, HIGH CAPACITY POWER REQUIREMENTS FOR FUTURE NASA SPACE INITIATIVES

- INCREASE SYSTEM THERMAL ELECTRICAL ENERGY CONVERSION EFFICIENCY AT LEAST FIVEFOLD
- ACHIEVE SYSTEMS COMPATIBLE WITH SPACE NUCLEAR REACTORS

APPROACH:

EXPERIMENTAL VERIFICATION OF ADVANCED ENERGY CONVERSION TECHNOLOGIES, SUCH AS THE FREE-PISTON STIRLING ENGINE AND HIGH EFFICIENCY THERMOELECTRIC MATERIALS

HIGH CAPACITY POWER

OAST CSTI

MANAGEMENT

- **LEAD OAST DIVISION**

  PROPULSION, POWER, AND ENERGY DIVISION

- **LEAD NASA FIELD CENTER**

  LEWIS RESEARCH CENTER

- **PARTICIPATING CENTER**

  JET PROPULSION LABORATORY

- **FY 1989 BUDGET: $ 11.1 M**

HIGH CAPACITY POWER

CSTI PROGRAM BUDGET

OAST — CSTI

ELEMENTS	FY 88	FY89	PLANNED FY 90-94
ROBOTICS	13.0	13.8	80
AUTONOMOUS SYSTEMS	12.1	12.1	70
EARTH-TO-ORBIT	15.8	29.1	160
BOOSTER TECHNOLOGY	8.0	9.0	20
AEROASSIST FLIGHT EXP.	15.0	13.3	150
SCIENCE SENSOR TECHNOLOGY	7.8	7.8	40
DATA: HIGH RATE/CAPACITY	8.7	8.1	30
CONTROL OF FLEX. STRUCTURES	17.1	15.7	100
PRECISION SEG. REFLECTORS	4.9	4.9	10
HIGH CAPACITY POWER	12.8	11.1	40
PROGRAM TOTALS	115.2	121.8	700

TECHNOLOGY TRANSFER TO THE USER

OAST — CSTI

- INCLUDE NASA USER REPRESENTATIVES IN
  - ADVISORY GROUPS
  - WORKING GROUPS
- INCLUDE INDUSTRY AND UNIVERSITY REPRESENTATIVES AS APPROPRIATE
- DISSEMINATE INFORMATION TO SPACE COMMUNITY VIA
  - REPORTS
  - PAPERS
  - PRESENTATIONS

CSTI 88-019